

We claim:

Sub B1 1. A method of detecting a windshear condition in an atmosphere in front of an aircraft, the method comprising the steps of:

- 5 (a) projecting a series of optical pulses into an atmosphere ahead of the aircraft;
- (b) detecting a series of reflected optical responses from the atmosphere corresponding to reflections from predetermined distances in front of the aircraft;
- (c) processing said reflected responses to determine a current relative wind speed at said predetermined distances in front of said aircraft;
- 10 (d) processing said current relative wind speeds to determine if a windshear condition exists in front of said aircraft.

2. A method as claimed in claim 1 wherein said step (c) includes the step of:

utilising a global positioning system to determine a current position and the frequency shift of said reflected optical pulse to determine the current relative wind speed at said predetermined distance in front of said aircraft.

15 Sub B2 3. A method as claimed in claim 1 wherein said optical pulses are derived from a laser having a small wavelength range.

4. A method as claimed in claim 1 wherein said step (c) includes the step of:

determining the Doppler shift in the reflected response utilising a differential Mach-Zehnder Interferometer.

20 5. A method as claimed in claim 1 wherein said step (c) includes the step of:

storing each of said current relative windspeed for each of said predetermined distances.

6. A method as claimed in claim 1 wherein said method is repeated at regular time intervals of less than 10 seconds.

7. A method as claimed in claim 1 wherein said predetermined distances include a range from substantially 0.2 kilometres to 4.0 kilometres in front of the aircraft.

25 Sub B3 8. A detection system for detecting the presence of windshear in front of an aircraft, said system comprising:

- a laser for transmitting a first portion of a series of optical pulses in front of said aircraft;
- a receiver for detecting back scattered light from said transmitted optical pulses;

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delay means for delaying a second portion of said series of optical pulses for a time period substantially corresponding to the time of flight of said back scattered light; and

first comparison means for comparing said delayed second portion with said back scattered light so as to determine a wind velocity and direction, relative to said aircraft at a series of distances corresponding to said time of flight of each pulse;

second comparison means for comparing the wind velocity at said series of distances to determine if a windshear event is present.

9. A system as claimed in claim 4 wherein said first comparison means includes a Dual Differential Mach-Zehnder interferometer to indicate the frequency difference and positioning between two light beams, said interferometer comprising:

a First Mach-Zehnder interferometer incorporating a delay in one arm; and

a Second Mach-Zehnder interferometer incorporating a different delay in one arm; and

a means of determining the detected output of the First Mach-Zehnder to indicate the doppler shift in a first light beam; and

a means of determining the output of the Second Mach-Zehnder to indicate a wind velocity at a reflected distance from said aircraft.

10. A Detection System to predict the presence of windshear along the flight path of an aircraft during the critical landing and take off phase comprising:

high powered solid state laser for transmitting a light beam; and

receiver to capture a second back scattered light beam from the first beam; and

a means to provide a third light beam as a sample of the first beam; and

solid state module to delay said third beam for a time corresponding to the transit time of the second light beam and the first light beam; and

solid state detector to detect a differential response of the second light beam to the response of third light beam; and

solid state computer to record and store a wind velocity measurement.

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